

Appl. No. 10/722,004
Amdt. dated July 10, 2006
Reply to Office action of March 9, 2006

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-20. (Canceled)

21. (New) A laser survey device for performing a runway survey on a rail system, the rail system utilized to support a device such as an overhead crane, the laser survey device comprising:

a laser unit mounted on a rail of the rail system, the laser unit including a laser; and
a self-propelled survey car supported on the rail for movement relative to the laser, the survey car including a mounting structure movable between a first position in which the mounting structure is positionable proximate the rail and a second position in which the mounting structure engages the rail to mount the survey car to the rail, the survey car also including a drive mechanism to move the survey car along the rail relative to the laser, and an image acquisition device, wherein the laser emits a laser beam that projects a laser spot on the image acquisition device and the image acquisition device captures an image of the laser spot.

22. (New) A laser survey device according to claim 21 wherein the drive mechanism includes at least one drive wheel supported on the rail of the rail system.

23. (New) A laser survey device according to claim 21 wherein the image acquisition device includes a screen and an image capturing device positioned to obtain an image of the screen, and wherein the image capturing device captures an image of the screen that includes an image of the laser spot.

24. (New) A laser survey device according to claim 23 wherein the image acquisition device includes a filter positioned adjacent the image capturing device and between the image capturing device and the screen.

25. (New) A laser survey device according to claim 23 wherein the image capturing device is spaced from the screen by a distance substantially equal to a focal length of the image capturing device.

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26. (New) A laser survey device according to claim 23 wherein the image capturing device is a CCD camera.
27. (New) A laser survey device according to claim 21 wherein the self-propelled survey car also includes an encoder connected to a shaft, wherein movement of the shaft is representative of movement of the survey car relative to the laser, and wherein the encoder triggers acquisition of the image of the laser screen by the image acquisition device.
28. (New) A laser survey device according to claim 21 wherein the survey car includes a first biasing assembly contacting a first side portion of the rail and a second biasing assembly contacting a second side portion of the rail to center the survey car on the rail.
29. (New) A laser survey device according to claim 28 wherein the first and second biasing assemblies each include a guide roller biased toward the corresponding side portion of the rail by a spring.
30. (New) A laser survey device according to claim 21 wherein the survey car is a top-running survey car.
31. (New) A laser survey device according to claim 21 wherein the survey car is a bottom-running survey car.
32. (New) A laser survey device according to claim 21 wherein the mounting structure includes a pair of brackets generally aligned to each other and spaced apart wherein the brackets are movable relative to each other between the first position and the second position.
33. (New) A laser survey device according to claim 32 wherein a scissors arrangement extends between the brackets to facilitate movement of the mounting structure between the first and second positions.

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34. (New) A laser survey device according to claim 32 wherein the drive mechanism is coupled to at least one of the brackets of the mounting structure.

35. (New) A laser survey device according to claim 21, and further comprising a computer for analyzing the captured images to determine positioning of the rail.

36. (New) A method of performing a runway survey on a rail system, the rail system utilized to support a device such as an overhead crane, the method comprising:

mounting a laser unit having a self-leveling laser on the rail system, the self-leveling laser including a level sensor positioned to determine a level condition of the laser, the level sensor generating a signal representative of the level condition of the laser;

adjusting a level position of the laser using the signal generated by the level sensor;

supporting a survey car on the rail system for movement along the rail system relative to the laser, the survey car including an image acquisition device and an encoder connected to a shaft of the survey car wherein movement of the shaft is representative of movement of the survey car relative to the laser;

projecting a laser spot on the image acquisition device by emitting a laser beam from the laser when the laser is substantially level;

capturing an image of the laser spot using the image acquisition device wherein the encoder triggers the image acquisition device to capture the image of the laser spot based upon a position of the survey car on the rail system relative to the laser;

analyzing the captured images to determine positioning of the rail system.

37. (New) A method according to claim 36 wherein the image acquisition device includes a screen and an image capturing device positioned to obtain an image of the screen, wherein projecting a laser spot on the image acquisition device includes projecting a laser spot on the screen, and wherein capturing an image of the laser spot includes capturing an image of the screen that includes an image of the laser spot.

38. (New) A method according to claim 37 and further comprising filtering the light entering the image capturing device using a bandpass filter.

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39. (New) A method according to claim 36 wherein analyzing the captured images includes determining a centroid of each image of the laser spot and comparing the centroid with a datum point to determine whether adjustment of the rail system is necessary.

40. (New) A method according to claim 36 wherein supporting a survey car on the rail system includes centering the survey car on a rail of the rail system using first and second biasing assemblies respectively positioned on each side of the rail.

41. (New) A method according to claim 36, and further comprising controlling movement of the survey car on the rail system from a remote position.

42. (New) A method according to claim 36, and further comprising transmitting data representative of the captured image to a computer.

43. (New) A method according to claim 36, and further comprising driving the survey car along the rail system relative to the laser using a drive mechanism, wherein the drive mechanism includes the encoder and at least one drive wheel supported by the shaft on the rail system.

44. (New) A method according to claim 43 wherein the image acquisition device captures a plurality of images of the laser spot as the survey car is driven along the rail system based upon a signal from the encoder.

45. (New) A method of performing a runway survey on a rail system, the rail system utilized to support a device such as an overhead crane, the method comprising:

mounting a laser unit on the rail system, the laser unit including a laser;

supporting a survey car on the rail system for movement along the rail system relative to the laser, the survey car including a screen and an image capturing device positioned to obtain an image of the screen;

emitting a laser beam from the laser, the laser beam projecting a laser spot on the screen;

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capturing an image of the screen using the image capturing device, the image of the screen including an image of the laser spot;
transmitting the captured image to a computer;
analyzing the captured image to determine a center point of the captured image, the center point having an X dimension and a Y dimension;
comparing the X and Y dimensions of the center point with a datum point; and
calculating a deviation of the center point with respect to the datum point to determine whether adjustment of the rail system position is necessary.

46. (New) A method according to claim 45 wherein analyzing the captured image includes performing a centroidal analysis of the captured image to determine the X dimension and the Y dimension.

47. (New) A method according to claim 45, and further comprising triggering acquisition of the image of the screen based upon movement of the survey car along the rail system relative to the laser unit.

48. (New) A method according to claim 47 wherein a plurality of images of the laser spot are captured using the image capturing device, and further wherein analyzing the captured image includes performing a centroidal analysis of each captured image.